

What is claimed is:

1 1. A support system comprising:

2 a mechanism designing section for
3 three-dimensionally designing a mechanism composed of a
4 plurality of parts including an actuator and a sensor;

5 a three-dimensional-mechanism model simulating
6 section, in which the mechanism is structured as a
7 three-dimensional-mechanism model, for simulating an
8 operation of the mechanism;

9 an embedded software developing section for
10 developing a control program, which is embedded in the
11 mechanism to control the operation of the mechanism, as
12 embedded software;

13 a first interface section for inputting designing
14 data, which is created in said mechanism designing section
15 as the result of the designing by said mechanism designing
16 section, from said mechanism designing section to said
17 three-dimensional-mechanism model simulating section to
18 be reflected on the three-dimensional-mechanism model;
19 and

20 a second interface section for transferring data
21 between said three-dimensional-mechanism model
22 simulating section and said embedded software developing
23 section while synchronizing said
24 three-dimensional-mechanism model simulating section and
25 said embedded software developing section in operation

26 with each other.

1 2. A support system according to claim 1, wherein
2 said first interface section inputs the result of the
3 simulating by said three-dimensional-mechanism model
4 simulating section from said three-dimensional-mechanism
5 model simulating section to said mechanism designing
6 section to be reflected on the designing of the mechanism.

1 3. A support system according to claim 1, wherein:
2 said embedded software developing section includes
3 a status-transition diagram or table creating section for
4 creating and editing a status-transition diagram or table
5 describing specifications of the embedded software to
6 execute detailed designing of the embedded software; and
7 said second interface section transfers data
8 between said three-dimensional-mechanism model
9 simulating section and said status-transition diagram or
10 table creating section while synchronizing said
11 three-dimensional-mechanism model simulating section and
12 said status-transition diagram or table creating section
13 in operation with each other.

1 4. A support system according to claim 3, wherein:
2 said status-transition diagram or table creating
3 section employs a multi-task, which executes a plurality
4 of tasks in parallel to one another, and executes,

5 separately from the plural tasks, a synchronous task
6 functioning so as to stop the plural tasks during the
7 simulation operation of said three-dimensional-mechanism
8 model simulating section; and

9 said second interface section synchronizes said
10 three-dimensional-mechanism model simulating section and
11 said status-transition diagram or table creating section
12 in operation with each other using the synchronous task.

1 5. A support system according to claim 4, wherein
2 the synchronous task is set to a highest priority to
3 control starting/stopping of the plural tasks in
4 accordance to the synchronous task to thereby synchronize
5 said three-dimensional-mechanism model simulating
6 section and said status-transition diagram or table
7 creating section in operation with each other

1 6. A support system according to claim 1, wherein:
2 said embedded software developing section includes
3 a microcomputer chip in which said embedded software is
4 embedded during the developing; and

5 said second interface section transfers data
6 between said three-dimensional-mechanism model
7 simulating section and said microcomputer chip while
8 synchronizing said three-dimensional-mechanism model
9 simulating section and said microcomputer chip in
10 operation with each other.

1 7. A support system according to claim 6, wherein:
2 said microcomputer chip employs a multi-task, which
3 executes a plurality of tasks in parallel to one another,
4 and executes, separately from the plural tasks, a
5 synchronous task functioning so as to stop the plural tasks
6 during the simulation operation of said
7 three-dimensional-mechanism model simulating section;
8 and

9 said second interface section synchronizes said
10 three-dimensional-mechanism model simulating section and
11 said microcomputer chip in operation with each other using
12 the synchronous task.

1 8. A support system according to claim 7, wherein
2 said three-dimensional-mechanism model simulating
3 section and said microcomputer chip are synchronized in
4 operation with each other by setting the synchronous task
5 to a highest priority to control starting/stopping of the
6 plural tasks in accordance to the synchronous task.

1 9. A support system according to claim 1, wherein
2 said second interface section transfers:

3 an actuator instruction signal for the actuator in
4 the three-dimensional-mechanism model from said embedded
5 software developing section to said
6 three-dimensional-mechanism model simulating section;

7 and

8 a sensor signal, which is obtained as the result of
9 simulation in response to said actuator instruction signal,
10 from said three-dimensional-mechanism model simulating
11 section to said embedded software developing section.

1 10. A support system according to claim 9, further
2 comprising an analyzing section for analyzing and
3 displaying variation of said actuator instruction signal
4 for the actuator and said sensor signal from said
5 three-dimensional-mechanism model simulating section
6 with real time.

1 11. A computer-readable recording medium in which
2 a support program to realize, on a computer, a function
3 of assisting a development of embedded software to be
4 embedded in a mechanism, composed of a plurality of parts
5 including an actuator and a sensor, as a control program
6 to control the mechanism is recorded, said support program
7 comprises:

8 a mechanism designing program for instructing the
9 computer to function as a mechanism designing section
10 which designs the mechanism three-dimensionally;

11 a three-dimensional-mechanism model simulating
12 program for instructing the computer to function as a
13 three-dimensional-mechanism model simulating section, in
14 which the mechanism is structured as a

15 three-dimensional-mechanism model, for simulating an
16 operation of the mechanism;
17 an embedded software developing program for
18 instructing the computer to function as an embedded
19 software developing section which develops the embedded
20 software;
21 a first interface program for instructing the
22 computer to function as a first interface section for
23 inputting designing data, which is created in said
24 mechanism designing section as the result of the designing
25 by said mechanism designing section, from the mechanism
26 designing section to the three-dimensional-mechanism
27 model simulating section to be reflected on the
28 three-dimensional-mechanism model; and
29 a second interface program for instructing the
30 computer to function as a second interface section which
31 transfers data between the three-dimensional-mechanism
32 model simulating section and the embedded software
33 developing section while synchronizing the
34 three-dimensional-mechanism model simulating section and
35 the embedded software developing section in operation with
36 each other.

1 12. A computer-readable recording medium according
2 to claim 11, wherein said first interface program inputs
3 the result of the simulating by said
4 three-dimensional-mechanism model simulating section

5 from said three-dimensional-mechanism model simulating
6 section to said mechanism designing section to be
7 reflected on the designing of the mechanism.

1 13. A computer-readable recording medium according
2 to claim 11, wherein:

3 said embedded software developing program includes
4 a status-transition diagram or table creating program
5 instructing the computer to function as a
6 status-transition diagram or table creating section for
7 creating and editing a status-transition diagram or table
8 describing specifications of the embedded software to
9 execute detailed designing of the embedded software; and
10 said second interface program transfers data
11 between said three-dimensional-mechanism model
12 simulating section and said status-transition diagram or
13 table creating section while synchronizing said
14 three-dimensional-mechanism model simulating section and
15 said status-transition diagram or table creating section
16 in operation with each other.

1 14. A computer-readable recording medium according
2 to claim 13, wherein:

3 said status-transition diagram or table creating
4 program employs a multi-task, which executes a plurality
5 of tasks in parallel to one another, and executes,
6 separately from the plural tasks, a synchronous task

7 functioning so as to stop the plural tasks during the
8 simulation operation of said three-dimensional-mechanism
9 model simulating section; and

10 said second interface program synchronizes said
11 three-dimensional-mechanism model simulating section and
12 said status-transition diagram or table creating section
13 in operation with each other using the synchronous task.

1 15. A computer-readable recording medium according
2 to claim 14, wherein said three-dimensional-mechanism
3 model simulating section and said status-transition
4 diagram or table creating section are synchronized in
5 operation with each other by setting the synchronous task
6 to a highest priority to control starting/stopping of the
7 plural tasks in accordance to the synchronous task.

1 16. A computer-readable recording medium according
2 to claim 11, wherein said second interface program
3 transfers data between said three-dimensional-mechanism
4 model simulating section and a microcomputer chip, in
5 which said embedded software being developed is embedded,
6 while synchronizing said three-dimensional-mechanism
7 model simulating section and said microcomputer chip in
8 operation with each other.

1 17. A computer-readable recording medium according
2 to claim 16, wherein:

3 said microcomputer chip employs a multi-task, which
4 executes a plurality of tasks in parallel to one another,
5 and executes, separately from the plural tasks, a
6 synchronous task functioning so as to stop the plural tasks
7 during the simulation operation of said
8 three-dimensional-mechanism model simulating section;
9 and

10 said second interface program synchronizes said
11 three-dimensional-mechanism model simulating section and
12 said microcomputer chip in operation with each other using
13 the synchronous task.

1 18. A computer-readable recording medium according
2 to claim 17, wherein said synchronous task is set to a
3 highest priority to control starting/stopping of the
4 plural tasks in accordance to the synchronous task to
5 thereby synchronize said three-dimensional-mechanism
6 model simulating section and said microcomputer chip in
7 operation with each other.

1 19. A computer-readable recording medium according
2 to claim 11, wherein said second interface program
3 transfers:

4 an actuator instruction signal for the actuator in
5 the three-dimensional-mechanism model from said embedded
6 software developing section to said
7 three-dimensional-mechanism model simulating section;

8 and

9 a sensor signal, which is obtained as the result of
10 simulation in response to said actuator instruction signal,
11 from said three-dimensional-mechanism model simulating
12 section to said embedded software developing section.

1 20. A computer-readable recording medium according
2 to claim 19, wherein said support program further
3 comprises an analyzing program for instructing the
4 computer to function as an analyzing section which
5 analyzes and displays variation of said actuator
6 instruction signal for the actuator and said sensor signal
7 from said three-dimensional-mechanism model simulating
8 section with real time.